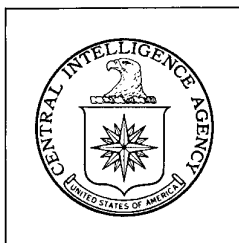


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**Top Secret**



DIRECTORATE OF  
INTELLIGENCE

## *Imagery Analysis Report*

Solid Rocket Motor Test Facilities,  
Leningrad, USSR

**Top Secret**

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## SOLID ROCKET MOTOR TEST FACILITIES, LENINGRAD, USSR

## SUMMARY

Three separate, but related, solid rocket motor test facilities are located northeast of Leningrad. Their combined total of 15 test cells and positions constitutes the largest assemblage of solid rocket motor test facilities in the USSR.

This report describes these facilities in detail and traces their development from the time they were first seen in 1961 through coverage of [REDACTED]

One of the facilities was possibly complete and operational as early as 1961, but it was not confirmed as operational until 1963. Because of its construction timing and initial operational capability, this facility is most likely involved in rocket motor R&D programs. The other two facilities were under construction from 1961 to 1964 and became operational in 1964 and 1965. One of these appears to be a production or acceptance testing facility which has not yet reached its full testing capacity. The other, in addition to motor testing, has a large support and vibration/structural test section which is believed to support all three facilities. Based on a comparative analysis of the size and the timing of the blast marks at all three facilities, it appears that once a rocket motor R&D program has been successfully completed at the one facility, the system is then acceptance tested at the other two facilities.

Some of the test positions at the apparent production and acceptance testing facility provide one of the few instances of close physical similarity between Soviet and U.S. test positions. Five of the six horizontal positions in that Leningrad facility are quite similar in configuration and spacing to the [REDACTED]

thrust. However, any conclusions about the Leningrad positions based on this comparison must be qualified by the fact that we have not seen any actual motors at Leningrad.

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FIGURE 1. LENINGRAD SOLID MOTOR TEST FACILITIES AND POSSIBLE SOLID ROCKET ASSOCIATED PLANTS

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## INTRODUCTION

The Leningrad Solid Rocket Motor Test Facilities are located along the eastern boundary of a former projectile test range which extends from the edge of Leningrad for a distance of about 20 nautical miles (nm) to the northeast (Figure 1). Although separate from one another, the three facilities are related and contain the largest concentration of solid rocket motor test cells and positions in the USSR.

Test Facility 1 was under construction from 1961 to 1963 and was first observed complete in [REDACTED]. A possible blast mark was seen in [REDACTED] while part of the facility was still under construction. The first confirmed blast mark was observed in [REDACTED]. In addition to static testing, Test Facility 1 is also believed to support the other two test facilities through the use of an elaborate support and possible vibration/structural testing section which is not present at the other two facilities.

Test Facility 2 was possibly complete by 1961, but because of poor photography, blast marks could not be detected at that time. Possible blast marks were observed in [REDACTED] at which time the facility was complete, and blast marks were confirmed in [REDACTED]. It is possible that Test Facility 2 was involved in early R&D testing on the same or similar size rockets which are now being fired at Test Facilities 1 and 3. The similarity of rocket size is indicated by the presence of blast marks observed at Facilities 1 and 3. The assumption that Test Facility 2 serves an R&D role is based on the observation of blast marks there at least 27 months before they were observed at Facility 3 and eleven months before they were observed at Facility 1.

Test Facility 3 was in an early stage of construction in 1962 and was first observed complete in [REDACTED]. A suspect blast mark was seen in [REDACTED] and a confirmed mark was identified in [REDACTED]. Test Facility 3 is thought to be a production test facility because of the presence of five nearly identical test positions. These could indicate a rather large test program indicative of production/acceptance testing.

Construction chronology and test activity at the three installations is shown in Table V. The lengths of blast marks observed at the test cells from 1961 to 1967 are shown in Table IV.

The location of the rocket propellant/motor production plants which the facilities support has not yet been firmly established. The Petrokrepost Probable Rocket Motor Plant, Morozov (Figure 1), located 13 nm east of Leningrad, may be using the test facilities; however this plant appears too small to be the exclusive user.

Another possible user is the Leningrad Chemical Combine, Okhtenskiy (Figure 1) which consists of at least five separate chemical plants in northeastern Leningrad and is probably involved in rocket production.

All mensuration was accomplished by the NPTC Technical Intelligence Division and is considered to be accurate within  $\pm$  five feet or  $\pm$  five percent, whichever is greater.

## LENINGRAD SOLID ROCKET MOTOR TEST FACILITY 1

The Leningrad Solid Rocket Motor Test Facility 1 (Figure 2) is located five nm northeast of Leningrad at 60-03N 30-36E. It consists of three sections: a test section, a rail-served materials handling section, and a support and possible vibration/structural testing section. A rail spur from the facility joins the main rail line about one mile from the Chemical Combine, Okhtenskiy in northeastern Leningrad, and another spur leads from this point to the Petrokrepost Probable Rocket Motor Plant, Morozov, approximately 14 nm to the east. Structures within the facility are shown in Figure 2; their function/description and dimensions are given in Table I.

### Test Section

The test section contains four, earth-barricaded, horizontal test cells which fire directly across the access road serving them. There are the large Test Cells 1 and 2 and the medium-size Test Cells 3 and 4.

Test Cells 1 and 2 are located approximately 330 feet apart, and 660 and 700 feet respectively from the earth-mounded instrumentation control building (Item 5). Test Cell 1 appears to be slightly longer than Test Cell 2. Dimensional details of Test Cell 2 are shown in Figure 3. The overall dimensions of Test Cells 1 and 2 are approximately 135 by 60 feet and 120 by 60 feet, respectively, each with a firing bay approximately 40 feet in width.

Test Cells 3 and 4, about 180 feet apart, are identical, earth-barricaded structures measuring approximately [REDACTED]. Details of Test Cell 3 are shown in Figure 4.

### Materials Handling Section

Incoming equipment and test items delivered by rail are off-loaded at the rail-to-road transfer facility. Two rail-mounted bridge-crane parallel the transfer facility can handle relatively large items.

A group of one large and seven small revetted storage/support buildings is located in the southeastern part of the section. These buildings are protected from explosions in the transfer facility by steep earthen blast walls.

### Support and Possible Vibration/Structural Testing Section

Vibration/structural testing of rocket motors and general support is probably done in the eleven buildings (Items 6-16) on the southwestern side of the test facility.

Seven of the buildings (Items 6-10, 12 and 13) are located in earthen barricades excavated from the natural gullies of the hillside. This indicates that these buildings are used for either storage or hazardous operations involving rocket motors. Vibration and structural tests could possibly be accomplished in the larger high-bay buildings (Items 8 and 10). The smaller low-bay buildings (Items 6 and 7) and the small high-bay buildings (Items

9 and 11) are located near the road and are more likely to be used for less dangerous operations such as storage and pre-post test checkout; however vibration/structural testing may be done in some of these buildings also.

The unrevetted and more closely spaced buildings (Items 13-16) probably serve a maintenance and administrative function for the test facility.

The absence of a large support and possible vibration and structural testing section at the other two Leningrad test facilities suggests that this section serves all three, though there is a small possible vibration/structural test building at Facility 3.

### Chronology of Test Facility 1

An anti-aircraft artillery unit occupied a part of the site of the test facility during World War II. The earthen blast walls, concrete apron, I-shaped building (Item 18) and four of the small buildings at the materials handling section are remnant features of this unit.

The first [REDACTED] photograph of [REDACTED] though of poor interpretability, revealed the service road along the base of the hill, excavations at the future locations of Test Cells 1 and 2, and excavations for buildings in the possible vibration/structural test section.

The rail spur to the test facility and five buildings (Items 6, 7, 9, 10 and probably 11) were observed on photography of poor interpretability in [REDACTED]. These buildings may have been present on the earlier, poor-quality photography of [REDACTED].

Photography of [REDACTED] revealed that excavating and construction were continuing at Test Cells 1 and 2 and the possible vibration/structural building (Item 10). Excavations for the smaller test cells (3 and 4) were observed in [REDACTED]. The support buildings (Items 15 and 16) were observed, but were probably present on the earlier photography.

Photography of [REDACTED] revealed that all four test cells were complete and barricaded and that trees had been cleared for a distance of approximately 700 feet in front of Test Cell 2. The instrumentation/control building (Item 5), the possible vibration/structural test buildings (Items 8 and 10), and support buildings (Items 13 and 14) were still under construction. By [REDACTED] the control building (Item 5) and the possible vibration/structural test building (Item 10) were complete and road served. The support buildings appeared complete except for the service roads and parking aprons. The possible vibration/structural test building (Item 8) lacked a roof, and the earth barricade was still under construction. A faint earth scar, possibly a blast mark, was observed at Test Position 1.

The entire test facility appeared complete and at least partially operational when observed in [REDACTED]. The first evidence of test activity at Test Cell 3 consisted of a blast mark approximately 125 feet in length on the snow-covered apron at this time.

A blast mark approximately 280 feet in length was observed at Test Cell 1 in [REDACTED]. Test firings may have already been conducted at Test Cell 2 at this time, but erosion, probably due to the removal of trees in front

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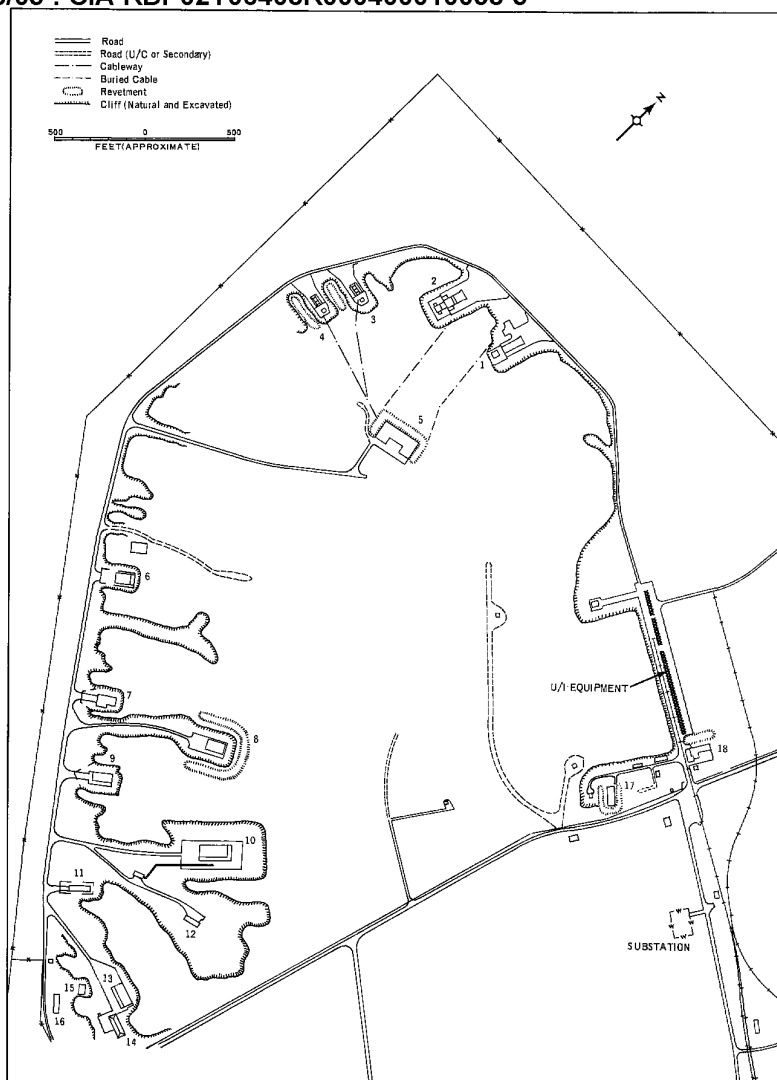
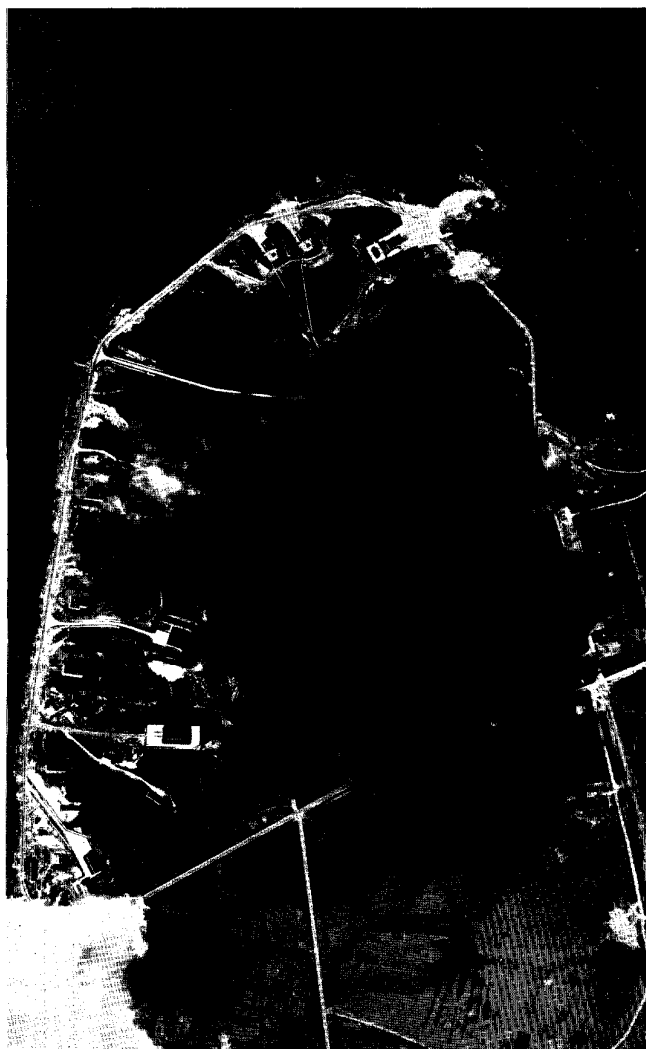
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TABLE I

STRUCTURES AT TEST FACILITY 1  
(Items Keyed to Figure 2)

Function/Description	Dimensions (Feet)
1. Test Cell 1 Control Building	135 by 60 (Overall) 60 by 35 (Overall)
2. Test Cell 2 Control Building	
3. Test Cell 3 Control Building	
4. Test Cell 4	
5. Instrumentation/ Control Building U-Shaped Main Section West Wing East Wing	
6. Storage/Checkout	
7. Storage/Checkout Attached Shed	
8. Possible Vibration/ Structural Testing	
9. Storage/Checkout	
10. Possible Vibration/ Structural Testing	
11. Storage/Checkout	
12. Storage/(Hazardous)	
13. Maintenance/Support	
14. Administration	
15. Support	
16. Possible Maintenance	
17. Storage/Support	
18. L-Shaped Building Main Section Attached Shed	

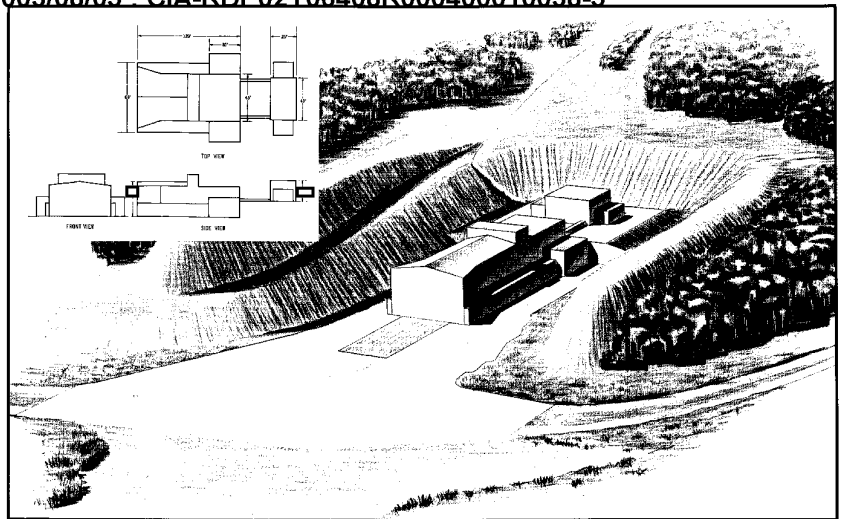


FIGURE 3. CONCEPT OF TEST CELL 2, TEST FACILITY No. 1

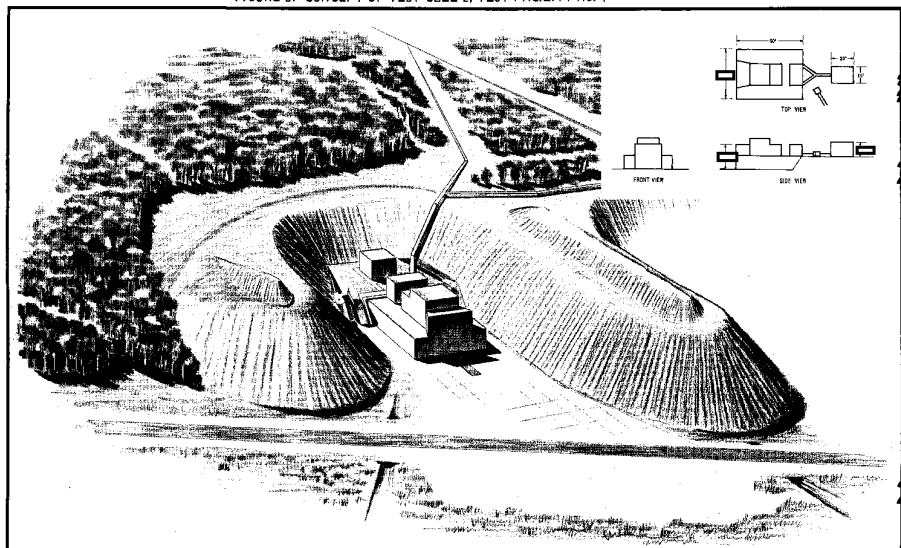


FIGURE 4. CONCEPT OF TEST CELL 3, TEST FACILITY No. 1

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of the cell during 1963, prevented a firm identification of blast marks.

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Evidence of continued test firings at Test Cells 1 and 2 and probable firings at Test Cell 3 were observed in [redacted] Dark blast marks approximately 125 feet in length at Test Cell 3 were observed on the snow in [redacted]

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The first evidence of possible test firings at Test Cell 4 was seen in [redacted] when a narrow band of erosion was observed along the front of the concrete apron.

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Test activity was not observed during the first part of 1966 because of heavy snow cover; however, test firings were evident at all four test cells during the remainder of the year and continued throughout 1967. Repeated firings have caused a continual lengthening of blast marks at all four cells. Approximate measurements of the blast marks made from the [redacted] photography were 295 feet at Test Cell 1, 315 feet at Test Cell 2, 325 feet at Test Cell 3, and 220 feet at Test Cell 4.

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#### LENINGRAD SOLID ROCKET MOTOR TEST FACILITY 2

The Leningrad Solid Rocket Motor Test Facility 2 (Figure 5) is located 14 mm northeast of Leningrad and nine mm northeast of Test Facility 1 at 60-12N 30-42E. It contains five horizontal positions, two for larger motors and three closely spaced positions for smaller motors, and a possible disposal area. The test positions are of simple design, consisting of concrete aprons located in rough excavations.

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The facility appears unfinished when compared with the other two Leningrad test facilities. Only the main access road and the road to Test Position 1 are paved. The few support structures are small and appear to be almost casually located. Bare earth around the test positions and a random pattern of unpaved roads throughout the facility indicate that mobility within the site becomes extremely difficult during bad weather. Structures within the facility are shown in Figure 5; their function/description and dimensions are given in Table II.

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Test Facility 2 was apparently the "lead facility" for the Leningrad Rocket Motor Test Facilities. While it cannot be confirmed from photography alone, it is hypothesized that Test Facility 2 was built for development testing of the rocket motor now being tested on a production or acceptance basis at Test Facility 3. This hypothesis is suggested because the "open" type of test position is found at both facilities and because the blast marks at both facilities are of the same 500-600-foot-length range. Furthermore, long blast marks were first observed at Test Facility 2 in [redacted] approximately 26 months before similar size marks were observed at Test Facility 3. This time span would appear to be an adequate lead time for development testing.

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It is possible that Facility 2 was also involved in development testing of the rockets now being fired at Facility 1. This is indicated by the presence of blast marks of 150-to-350-foot lengths at Facility 2 which correspond to the 125-to-325-foot lengths at Facility 1. These

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blast marks were observed at Facility 2 at least eleven months before they were seen at Facility 1.

#### Description of Test Facility 2

Four horizontal test positions (Items 1-3 and 5) and one possible horizontal test position (Item 4) are located at the edge of the cliff along the eastern side of a clearing.

Test Position 1 (Figure 6) is the largest and most elaborate position at the facility. It consists of a concrete apron, measuring approximately [redacted] located within an earthen barricade formed by excavating a natural gully.

Test Positions 2, 3, and 4 are located approximately 300 feet south of Position 1. They lack paved access roads and paved aprons and appear to be small notches or adits dug into the side of the cliff. Blast marks have never been observed at Test Position 4.

Test Position 5 (Figure 7) is located at the south-east end of the clearing. The position consists of a small concrete blast apron measuring approximately [redacted] located on a ledge just below the edge of the cliff.

A possible disposal area consisting of several shallow pits is located in the southwest corner of the clearing. This area is apparently used for the disposal of discarded propellant from the plants using the test facility. An unidentified, tall, crescent-shaped structure is located northwest of the possible disposal area. This structure resembles no previously observed testing equipment and its purpose is unknown. It is not likely that the structure is related to the test program conducted at the facility.

#### Chronology of Test Facility 2

The facility was possibly complete when observed on the first usable, but poor-quality, photography of [redacted] The cleared strip for the security fence was visible and trees had been removed from the central part of the facility. When next observed in [redacted] it was apparently complete. The main access road had been added and extensive ground scarring was observed at the test positions. This was most likely due to the removal of trees in front of the test positions, but may have been caused by test firings.

Firm evidence of test firings was observed on snow-covered photography in [redacted] A blast mark approximately 500 feet in length was present at Test Position 5, and a mark approximately 250 feet in length was observed at Test Position 2. Large burn marks and a smoke cloud were present at the disposal area. The unidentified, tall, crescent-shaped structure was observed for the first time, though it may have been present on the earlier photography.

Light-toned blast marks were evident at Test Position 1-3 and 5 throughout the summer of [redacted] blast marks measuring approximately 500 feet in length were observed at Positions 1 and 5 and approximately 300 feet in length at Positions 2 and 3.

In [redacted] snow-covered large-scale photography revealed blast marks measuring approximately 150 feet in

length at Test Position 1, 300 feet at Test Position 2, and 350 feet at Test Position 3. Since 1964 an apparent increase in the lengths of blast marks at Test Positions 1 and 5 has been observed. It is possible that the apparent lengthening is caused by the testing of a larger motor, but constant use and subsequent erosion could also produce a longer blast mark.

In [redacted] blast marks measuring approximately 630 and 570 feet in length were observed at Test Positions 1 and 5 respectively.

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TABLE II  
STRUCTURES AT TEST FACILITY 2  
(Items Keyed to Figure 5)

Function/Description	Dimensions (Feet)
1. Test Position 1 Blast Apron Dimensions Probable Thrust Block	
2. Test Position 2 Width of Notch/Adit	
3. Test Position 3 Width of Notch/Adit	
4. Possible Test Position 4 Width of Notch/Adit	
5. Test Position 5 Blast Apron Dimensions Probable Thrust Block	
6. Unidentified Object Chord Distance	
7. Support Building	
8. Support Building	
9. Support Building, Earth Mounded	
10. Support Building, Earth	
11. Probable Control Building, Earth Mounded	

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\* Denotes measurements made by IAS photo analyst.

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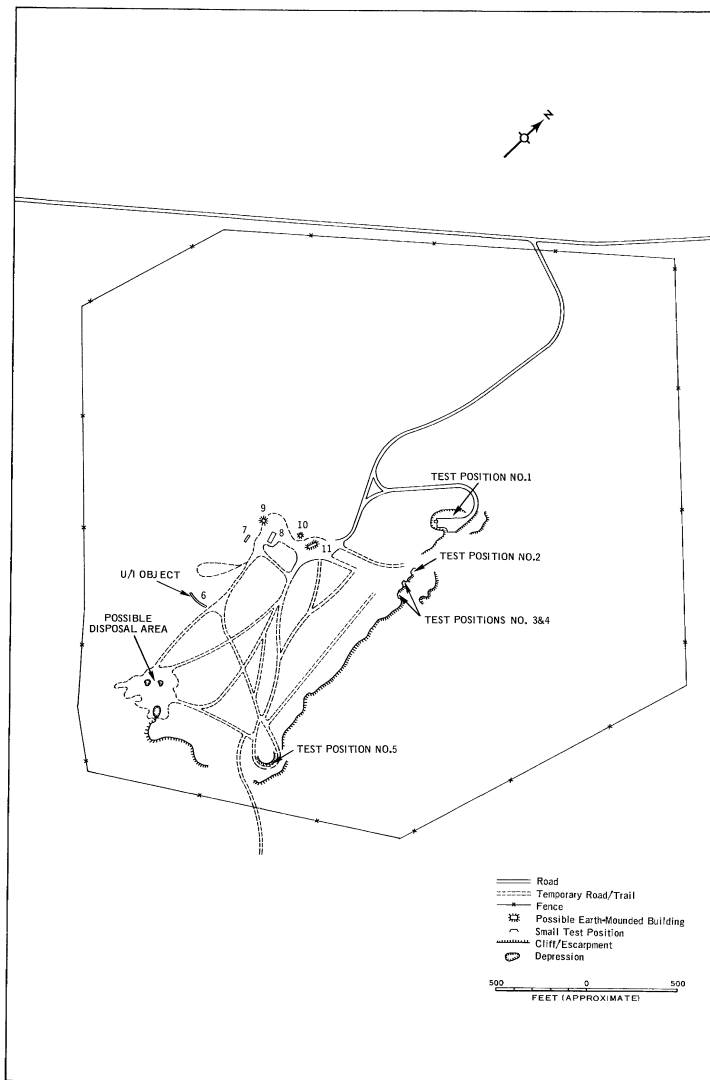


FIGURE 5. LENINGRAD SOLID MOTOR TEST FACILITY No. 2

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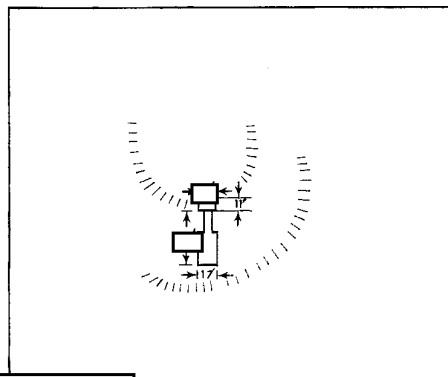
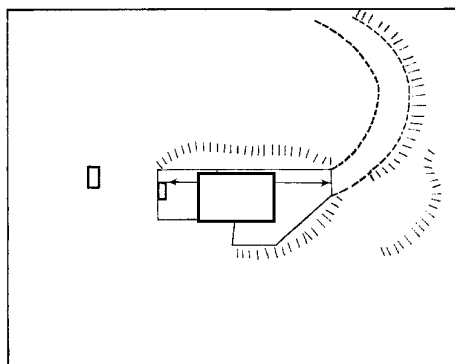


FIGURE 6. TEST POSITION 1, TEST FACILITY No. 2

FIGURE 7. TEST POSITION 5, TEST FACILITY No. 2

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#### LENINGRAD SOLID ROCKET MOTOR TEST FACILITY 3

The Solid Rocket Motor Test Facility 3 (Figure 8) is located at 60-15N 30-44E, 18 nm northeast of Leningrad and three nm northeast of Solid Rocket Motor Test Facility 2.

It contains six horizontal test positions (Figure 8, Items 1-6), a suspect subsurface vertical test position (Item 7), an earth-mounded control building (Item 8), an earth-barricaded possible vibration/structural test building (Item 9), and an earth-mounded possible storage building (Item 10). Three other buildings (Items 11-13) are located immediately outside the fence and probably house the administrative/engineering and support elements for the facility. Structures within the facility are shown on Figure 8; their function/description and dimensions are given in Table III.

#### Horizontal Test Positions

Five of the horizontal test positions (Items 1-5) have the same basic configuration of a concrete pad, measuring about [redacted] enclosed by a U-shaped earthen barricade. The spacing between the positions is about the same. In the northwest corner of each pad is a building which is probably connected to a passageway extending through the rear of the barricade. Above-ground instrumentation lines lead from each passageway to the control/instrumentation building, which is 575 feet to the rear of the nearest test position (Item 3).

All five of these positions originally contained a pair of small rectangular buildings directly opposite each other along the parallel sides of the revetment. However, Positions 1 and 3 have since been modified by the removal of both of these buildings and Position 5 by the removal of one. It is possible that these buildings are portable and can be replaced on short notice.

The rocket motor tie-down area for each pad originally appeared as a dark rectangular area aligned with the thrust block on the projecting end of a T-shaped building at the rear of the pad. At Position 3, however, an enclosed irregularly shaped structure, tentatively identified as a possible altitude simulation device, was later installed at the tie-down position. (Figure 9 shows Test Position 3 and the configuration of this device as it appears on the large-scale but non-sterco photography of [redacted]. This concept is subject to considerable change when better photography is available.) Other changes to the basic configuration of the five positions include a small probable camera station in the northeast corner of the pad at Positions 1, 4, and 5 and small over-looking camera or observation buildings on the sides of the barricade walls at Position 3.

Three motors are fired directly across the service road into clearings in front of these five test positions. This distance from the thrust block of each position to the outer edge of the road is approximately 210 feet.

The presence of five very similar positions suggests that a production or acceptance testing role was originally planned for Facility 3. Production testing of solid motors often requires the testing of a relatively large sample of the total production. The fact that only three of the positions (Numbers 2, 3, and 5) have thus far been

used indicates that full production has not been attained. These five positions are capable of testing firing rockets of fairly large size.

Another type of horizontal test position, Number 6 (Figure 10), is located approximately 500 feet southeast of Test Position 5. This position apparently has never been used. Its position consists of a paved, narrow blast apron measuring approximately [redacted] with the tie-down area located in a U-shaped earth barricade which has vertical concrete walls. A small, road-served observation building is located on an elevated concrete pad on top of the barricade. Cable/instrumentation lines can be traced from the control building (Item 8) to a small shed located immediately north of the blast apron. Two small camera stations are located on opposite sides of the apron approximately 225 feet from the end of the blast apron. This position most nearly resembles Test Position 1 at Test Facility 3.

#### Suspect Subsurface Vertical Test Position

A suspect subsurface vertical Test Position 7 (Figure 11) is located approximately 300 feet northeast of Test Position 6 and 300 feet east of Test Position 5. The position consists of a small irregularly shaped concrete pad containing two small structures and a hole measuring approximately [redacted] in diameter in the southeastern corner of the pad. Instrumentation lines to the position are not observed; however, the instrumentation line to Test Position 6, which passes approximately 30 feet to the south of the pad, could be connected to Test Position 7 by a buried line.

The control/instrumentation building (Item 8) is located in the central part of the facility. This earth-mounded building measures approximately [redacted]. Above ground instrumentation lines lead from the east side of the building to the rocket motor test positions.

#### Possible Vibration/Structural Test Buildings

An earthen-barricaded possible vibration/structural test building (Item 9) is located approximately 750 feet west of the control/instrumentation building and 650 feet northwest of Test Position 1. The building measures approximately [redacted] feet with a high bay section measuring approximately [redacted] feet in height. The massive earthen barricade and the distance from other structures indicate hazardous operations involving large quantities of explosive material.

#### Chronology of Test Facility 3

The first stages of construction, consisting of tree removal and excavating, were observed at the facility in [redacted].

When next observed, in [redacted] the roads were under construction and the cleared strip for the security fence was visible. Construction progressed at a fairly rapid rate during the summer of [redacted] most of the major items of the facility appeared complete except for the control/instrumentation building (Item 8) and Test Positions 6 and 7.

In [redacted] large-scale photography revealed that earth mounding of the control building was not yet complete and that Test Positions 6 and 7 were still under construction. In [redacted] the facility was outwardly complete and no changes were observed until [redacted]. Possible evidence of test activity was observed in [redacted] when a faint possible blast mark was observed at Test Position 5. Firm evidence of test activity was seen in [redacted] with a blast mark approximately 500 feet in length at Test Position 5. Heavy snow cover precluded observation of test activity during the early part of 1966. In [redacted] there was evidence of firings at Test Positions 2 and 5 and possibly 3. During [redacted] snow cover precluded observation of test activity, but when the facility was observed in [redacted] blast marks measuring approximately 480 feet and 510 feet in length were seen at Test Positions 2 and 5 respectively. In [redacted] blast marks 480 and 510 feet long were again observed at Test Positions 2 and 5, and a blast mark approximately 400 feet long was observed at Test Position 3. The possible altitude simulation device at Position 3 may account for the shorter blast mark there. At this time, it is not possible to accurately determine when this device first appeared since it could not be negated in [redacted] because of small-scale photography. However, an object which could have been the device was visible in [redacted].

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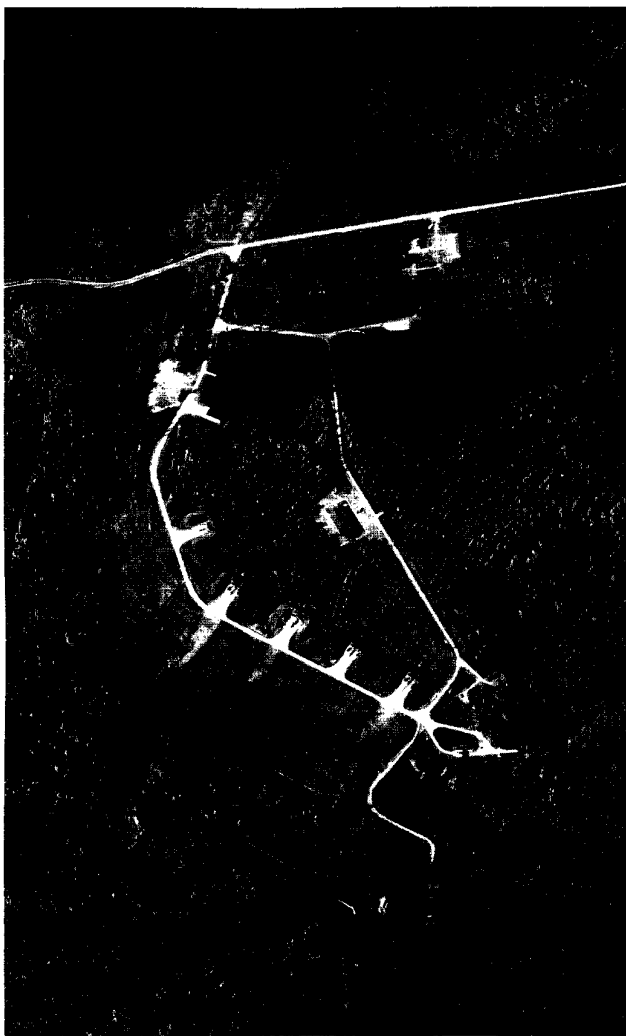
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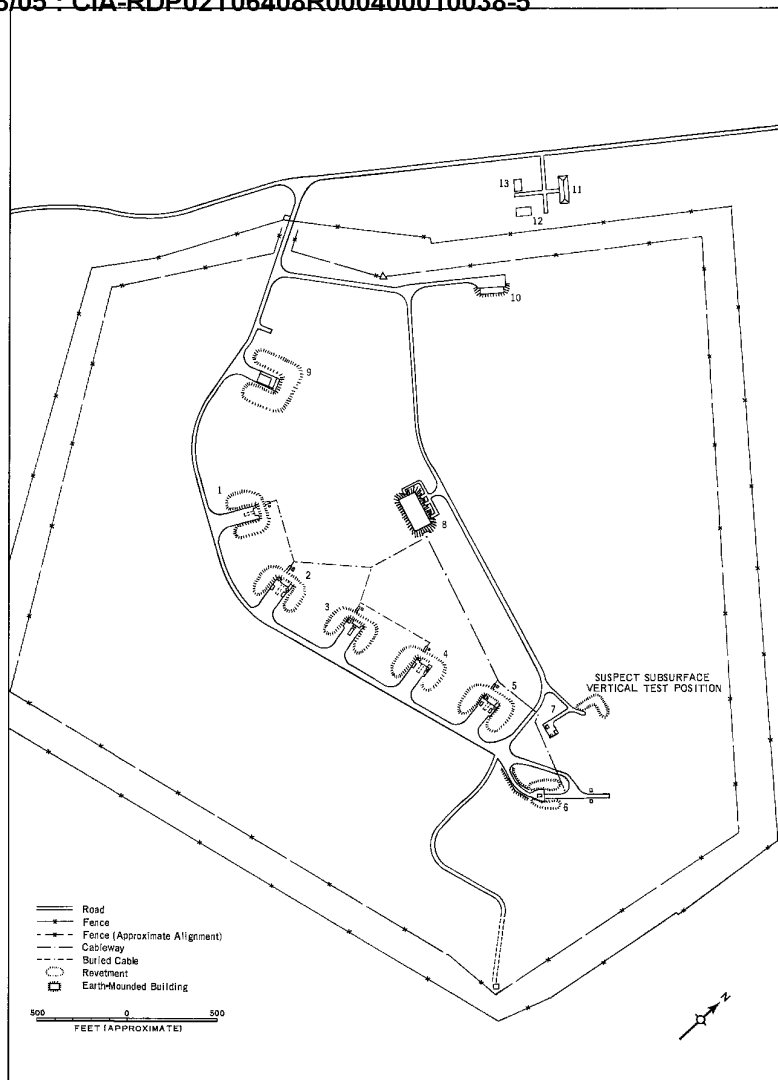
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FIGURE 8. Leningrad Solid Motor Test Facility No. 3

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TABLE III  
STRUCTURES AT TEST FACILITY 3  
(Items Keyed to Figure 8)

Function/Description	Dimensions (Feet)
1-5. Test Positions 1-5 Concrete Pads Probable Thrust Block	
6. Test Position 6 Concrete Apron	
7. Suspect Test Position 7 Hole Diameter	
8. Control/Instrumentation Building, Earth Mounded	
9. Possible Vibration/ Structural Test/ Support Building	
10. Possible Storage Building, Earth Mounded	
11, 12. Support Buildings	
13. Engineering/Administration Building	

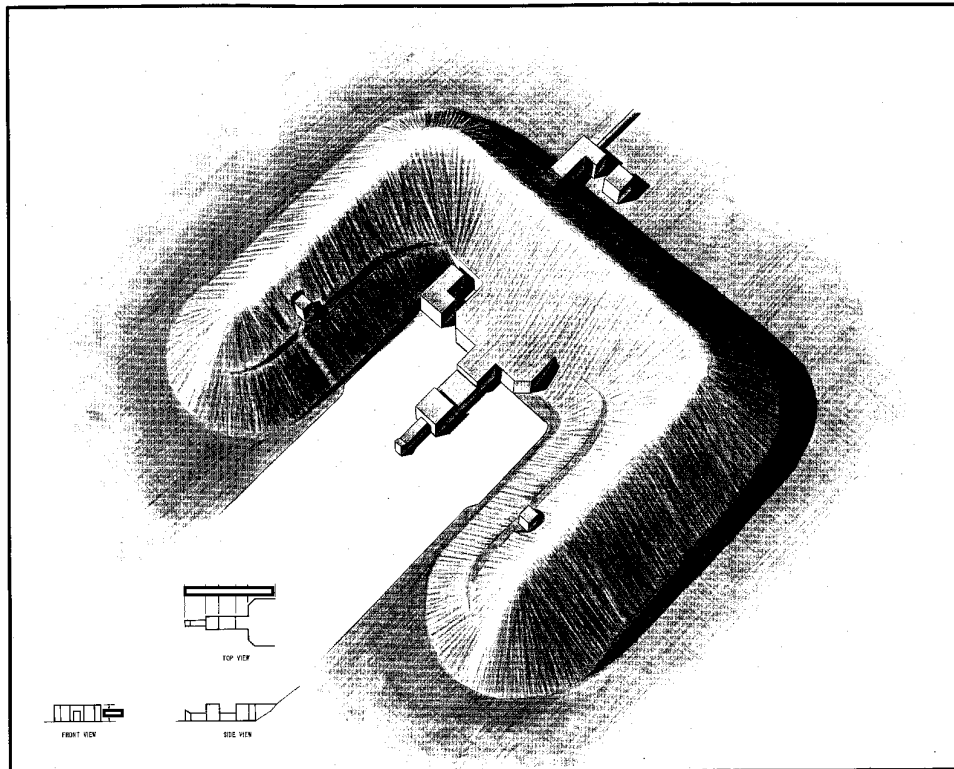


FIGURE 9. CONCEPT OF TEST POSITION 3, TEST FACILITY No. 3

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TOP SECRET

25X1

25X1

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